

BENNEKER et al
Serial No. 10/538,045
November 7, 2008

AMENDMENT TO THE DRAWINGS

The attached replacement sheet of drawings includes changes to Fig. 1 and is being filed as a replacement to the original sheet including Fig. 1.

Attachment: One (1) Drawing Replacement Sheet – Fig. 1

REMARKS

Favorable reconsideration and allowance of this application are requested.

1. Discussion of Amendments

By way of the amendment instructions above, pending independent claim 1 has been amended so as to be directed toward a process for producing cyclohexanone oxime (CHO) by cycling an aqueous reaction medium containing residual hydroxylammonium (HA) from a CHO synthesis reactor in which cyclohexanone oxime is produced by reaction of HA with cyclohexanone (CH) to a HA synthesis reactor in which HA is prepared by catalytic reduction of nitrate with hydrogen. Amended claim 1 also now requires that the first acidic aqueous solution comprising HA and phosphate be provided from at least a portion of the cycled aqueous reaction medium and mixed with the second acidic aqueous solution comprising nitric acid within or upstream of the HA synthesis reactor, resulting in a third acidic aqueous solution comprising HA, phosphate and nitric acid. Support for such amendments to claim 1 can be found in the originally filed specification at page 10, lines 8-15 and Figure 1 and the description thereof on page 11, line 22 through page 12, line 26.

Many of the dependent claims have been amended so as to be consistent with claim 1 while claims 4 and 15 have been canceled as redundant in view of such amendments. Claims 19-20 are new and are based on Figure 1 and the disclosure appearing on page 10, lines 8-15.

Therefore, following entry of this amendment, claims 1-3, 5-14 and 16-20 will remain pending herein for which favorable action on the merits is solicited.

A new title has been provided which is more commensurate with the amended claims presented herewith.

In order to cure a duplicate usage of reference numeral "16", a revised version of drawing Figure 1 is being submitted. A conforming amendment to the specification on page 12 has also been presented.

2. Response to 35 USC §103(a) Rejection

Prior claims 1-18 attracted a rejection under 35 USC §103(a) as allegedly "obvious" and hence unpatentable over de Rooij (USP 3, 997,607) in view of Benneker et al (WO 01/94296). Applicants suggest that neither de Rooij nor Benneker et al is appropriate as a reference against the presently pending claims.

One aspect of the present invention is that decomposition of HA remaining in the recycle stream of aqueous reaction medium from the oximation section (CHO synthesis zone) to the hydrogenation section (HA synthesis zone) is minimized or avoided. This aspect of the invention is achieved by providing a first acidic aqueous solution comprising HA and phosphate from at least a portion of the cycled aqueous reaction medium and mixing the first acidic aqueous solution with a second acidic aqueous solution comprising nitric acid either within or upstream of the HA synthesis reactor, resulting in a third acidic aqueous solution comprising HA, phosphate and nitric acid, while maintaining the total acid concentration minus the phosphate concentration in the third acidic aqueous solution lower than the formula of claim 1. Thus, such mixing of the first and second acidic aqueous solutions may be accomplished at one or more (different) mixing points, including mixing of the solutions within the HA reactor.

There is no teaching in either de Rooij or Benneker et al of avoiding of HA losses by decomposition of HA in the feed stream (recycle stream) to the HA reactor.

de Rooij focuses on the removal of (carbon compound) catalyst poisons for the hydrogenation section in the cyclohexanone oxime synthesis process. de Rooij

therefore suggests that, by such disclosed process (by heating and contacting with NO_x), an increase in the efficiency of the hydrogenation step can be achieved.

Benneker et al focusses on a higher efficiency of use of HA in the HPO process. This achieved according to Benneker et al by working within a new operating window characterized by a high HA concentration in the hydrogenation step, followed by an increased conversion of HA in the oximation step. There still remains unused HA in the tail-stream of the oximation reactor, which is decomposed in the recycle to the hydrogenation reactor.

Benneker et al explicitly acknowledges at page 2, lines 17-25 that:

“In a recycle process, it is often possible to recycle unconverted reactants, in which case an incomplete conversion does not result in a loss of reactants. However, we have found that, even without the heat treatment described in US-A-3,997,607, decomposition of hydroxylammonium occurs in the aqueous reaction medium which is recycled from the cyclohexanone oxime synthesis zone to the hydroxylammonium synthesis zone. *The decomposition is in particular found to occur following the addition of nitric acid to the aqueous reaction medium* or during the formation of nitric acid by absorption of nitrous gases in the aqueous reaction medium.” (Emphasis added)

The measure taken in the context of Benneker et al to overcome such problems is to increase the concentration of HA entering the CHO synthesis zone to a value of 1.0 mol/l (up to 2.5 mol/l). There is, however, no suggestion in Benneker et al of avoiding HA losses in a recycle stream from the CHO synthesis zone to the HA synthesis zone following addition of nitric acid by mixing of a first acidic aqueous solution (at least part of which is obtained from the recycle stream) and a second acidic aqueous solution to achieve a third acidic aqueous solution having the parameters required by claim 1.

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Finally, applicants note that while de Rooij mentions that nitric acid, a raw material for the making of HA, can be added to the recycle stream just before the hydrogenation step, the decomposition of HA cannot be avoided as is described in Benneker et al (see, the quotation above from page 2, lines 10-25 of Benneker et al). Thus, de Rooij does not teach at all the aspects of the present invention as defined in the presently pending claims.

Withdrawal of the rejection of record based on de Rooij and Benneker et al is therefore solicited.

3. Fee Authorization

The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Account No. 14-1140.

Respectfully submitted,

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